

A review of *Cladotanytarsus conversus* (Johannsen) with first records from Europe

(Insecta, Diptera, Chironomidae)

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The male, female, pupa and larva of *Cladotanytarsus conversus* (Johannsen) are redescribed including material from Europe and the Indian subcontinent. An account of the species' known biology is given and its biogeography discussed. Morphologically *C. conversus* appears to form a cline from the Far East to western Europe.

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Introduction

Among chironomids collected by X.-F.G. from the middle river Loire, France, were pupal exuviae which run to *Cladotanytarsus* Pe6 in Langton (1991). Bulk rearing from different substrata has provided pharate as well as partly and fully eclosed adult males and females. Initially the taxon was supposed a new species, but then Dr. F. Reiss (pers. comm. to P.H.L.) determined it as *Cladotanytarsus conversus* (Johannsen), described from specimens collected by A. Thienemann in Sumatra. Two adult male syntypes were borrowed from The Natural History Museum in London (BMNH). Further material from the Thienemann collections in Sumatra has been seen, together with specimens from the Orient and the West Palaearctic housed in the Zoologische Staatssammlung Munich (ZSM).

Standard morphological terminology is followed (Sæther 1980), with additions from Langton (1991), Langton & Armitage (1995), and Spies (1998).

Cladotanytarsus conversus (Johannsen)

Figs 1–6, Tab. 1

Tanytarsus conversus Johannsen, 1932: 543 (adults); Zavrel 1934: 161 (larva, pupa).

Cladotanytarsus conversus (Johannsen); Sublette & Sublette 1973: 416 (generic transfer); Chaudhuri & Chattopadhyay 1990: 167 (adult male).

Type material: 1♂ syntype, INDONESIA: S. Sumatra, Lake Ranau, 21.I.1929, leg. A. Thienemann, on slide labelled '*Tanytarsus (Cladotanytarsus) conversus* type', 'BMNH R4c = 105', and 'BM 1935-180 TYPE' (BMNH);

1 ♂ syntype, as previous except from outlet of Lake Ranau, 20.I.1929, on slide labelled '*Tanytarsus* (*Cladotanytarsus*) *conversus* paratype', 'R1f = 104', 'PARATYPE', and 'Dutch E. Indies Sumatra 1928-9 A.Thienemann. det. O.A.Johannsen B.M. 1937-703' (BMNH).

In alcohol (not seen): 1 ♀ syntype, as male 'type' (BMNH); 1 ♀ syntype, as male 'paratype' (BMNH).

Note. Johannsen (1932) did not designate a holotype. However, his description of the adult male is obviously based on a single specimen. For example, the stated absence of fore tarsi and sensilla basiconica on the anal point is true for only one of the male syntypes reexamined here. That specimen, illustrated in ventral view by Johannsen (1932, fig. 32), bears a label 'Type', while the second male is labelled 'Paratype'. Nevertheless, even if these labels were attached by Johannsen they are of no relevance to type status according to the Code of Zoological Nomenclature. As the morphology of the so-called 'Type' is not typical for the species (see 'Differential diagnoses'), a lectotype designation validating the label after the fact is considered unwarranted and unproductive.

Further material examined. INDONESIA, Sumatra: 1 pharate adult ♂ + part of 1 pharate adult ♀ on one slide, 2 pharate adult ♀♀ on one slide, 2 pharate adult ♀♀ + 1 pharate adult ♂ + 1 pupal exuviae on one slide, 1 larva, as male 'type' (Lake Ranau, 21.I.1929); 1 pupal exuviae + 1 larva, as male 'paratype' (Lake Ranau outlet, 20.I.1929) (all ZSM).

INDIA: 2♂♂, near Darjeeling, Rangeet River, 250m a.s.l., "Him.2"; XI.1961, leg. L. Brundin; 1♂, Madras State, Cauvery River, Kaveri-cross, 3 mi S. of Mattur, 750ft a.s.l., 12.I.1965 leg. W. L. & J. G. Peters; 1♂, West Bengal, Kalyani, 25.X.1986, leg. S. Chattopadhyay (all ZSM).

THAILAND: 1♂, Ping River, 15 km S. Chiang Dao, 30.XII.1989, leg. H. Malicky (ZSM).

FRANCE: Saumur, river Loire, leg. X.-F. Garcia; 20 pupal exuviae, surface drift, VII.1997; 14 larvae, VI.1998; 25 pupal exuviae, 5 pharate adult ♂♂, 5 pharate adult ♀♀, 15♂♂, 10♀♀, bulk rearing, VII.1998 (Coll. PHL).

GREECE: 1♂, Delphi, 15.VII.1976, leg. W. Bestler; 3♂♂, Karia, 40°00'N, 22°26'E, 750-800 m a.s.l., 20.VII.1974; 1♂, Chios, N. Keramos 38°34'N, 25°56'E, 60 m; 1 adult abdomen, Rhodope Mts, Hauptbach (main stream) No. 6, Prasinada, 24°32'N, 41°20'E, 18.VII. 1991, leg. H. Malicky (all ZSM).

Differential diagnoses. The adult male of *C. conversus* (Johannsen) is characterised by having a long anal point; in other described species of *Cladotanytarsus* the anal point ends abruptly behind the sensillar pit (Spies 1998) or bears a small apical nipple. Johannsen (1932) describes the anal point of *conversus* as a 'slender spur which apparently lacks the longitudinal row of dots an [sic!] the dorsal side'. There appear to be no sensilla basiconica in the anal point sensillar pit of the syntype labelled 'Type', but all other specimens from the Oriental region have 1-3, although they can be small. The specimens from Europe conform to the generic diagnosis in Cranston et al. (1989) by having 5-8 sensilla basiconica. On the only male seen from the material of Chaudhuri & Chattopadhyay (1990), there are only 4 scutellar setae, not 8-10 as stated by those authors, and the anal point bears at least 1 sensillum basiconicum, not "0".

The adult females of most West Palaearctic *Cladotanytarsus* have not been described. According to Sæther (1977), anterolateral spurs on tergite IX occur occasionally in the genus.

The pupa of *conversus* has the long thoracic horn fringed with setae except at tip, as shown by the Nearctic *C. daviesi* Bilyj (Bilyj & Davies 1989), but has more numerous taeniae in the anal lobe fringe (*daviesi* <20). *Cladotanytarsus* Pe6 (Langton 1991) from a river in Portugal is very similar, but smaller and with setae of thoracic horn less extensive; without associated material it is not possible to determine whether it is conspecific.

The *conversus* larva is so far unique in *Cladotanytarsus* by having the first lateral teeth of the mentum equally strongly developed as the median tooth. "*Tanytarsus* type *mancus* N7" (Zvereva 1950) from the Yaroslavl' district and Komi Autonomous Republic in Russia is known only as larva. It is close to *conversus*, as observed by Pankratova (1983) who reproduced Zvereva's figures. The first lateral teeth

Tab. 1. *Cladotanytarsus conversus* (Joh.); parametric differences between eastern, intermediate, and western populations.

	Oriental	eastern Mediterranean	river Loire
Wing length [mm]	1.2-1.62	1.4-1.7	1.6-1.95
Antennal ratio	0.71-0.89	0.98-1.12	1.15-1.38
Anal point sensilla basiconica	0-3	2-5	5-8

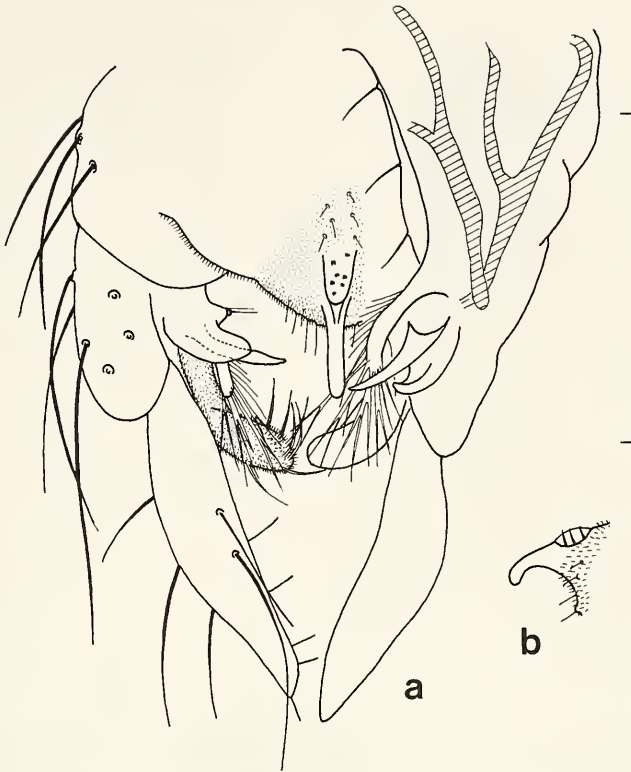


Fig. 1. *Cladotanytarsus conversus* (Joh.); male (river Loire). a. Hypopygium. b. Anal point, lateral. Scale line: 0.1 mm.

of the mentum, though well developed, are less high than the median tooth, and the mandible has two basal teeth on the inner side.

Description

Adult male.

Colour (fresh material from river Loire). Head olive green or buff with pedicellus, mouth and antennal plume brown. Thorax brownish with darker brown scutal stripes and sutures; anterior and posterior anepisternum II and a triangular area postero-dorsally on the preepisternum olive green or pale brown (giving the effect of two superimposed inverted triangular pale areas on the side of the thorax); legs green with bases of tibiae brown, or all pale brown. Abdomen green or buff with tergites sometimes infuscated posteriorly.

Head. Setae: 8-13 clypeals (n=9), 3-11 temporals (n=7). Antenna: pedicellus 0.69-0.87 times as long as broad; 13th flagellomere 291-512 μm long, AR 0.71-1.22 (n=17). Palpomere lengths 1-5 (in μm): 22-40, 30-62, 50-102, 72-112, 86-160 (n=14). Frontal tubercle papillate, 6-24 μm long (n=8).

Thorax. Setae: 4-10 acrostichals (n=10), 6-10 dorsocentrals, 1 or 2 prealars, 4 scutellars (n=13).

Wing. Length 1.2-1.95 mm (n=11); branches of vein R (except R₄₊₅ distally) and Cu without setae, M with setae on apical half; membrane with macrotrichia near wing tip only.

Legs. Segment lengths (in μm) and proportions:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR
p ₁	460-680	240-380	560-824	240-416	240-336	168-232	94-120	1.80-2.35
p ₂	480-720	360-600	220-352	120-208	80-160	56-104	50-88	0.57-0.70
p ₃	530-824	490-800	300-536	200-352	190-304	110-192	70-120	0.61-0.69

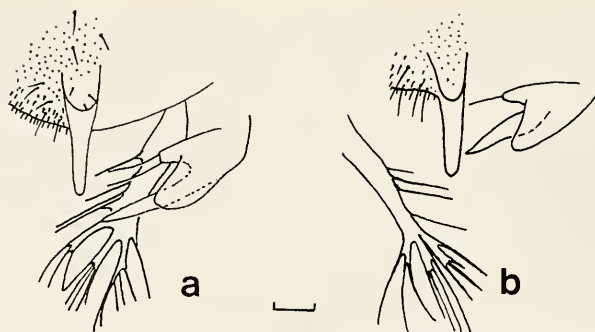


Fig. 2. *Cladotanytarsus conversus* (Joh.); male anal point, superior volsella, digitus and median volsella (Sumatra). a. 'paratype'. b. 'type'.

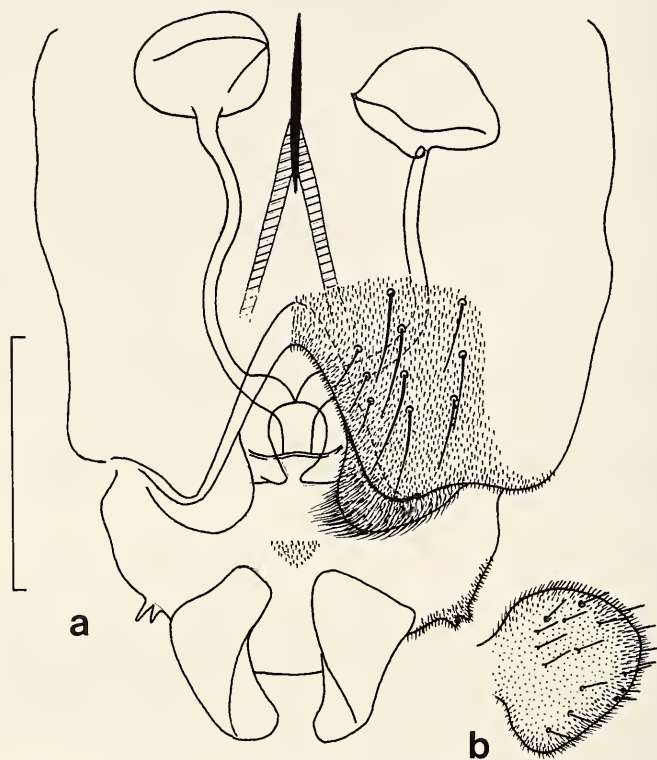


Fig. 3. *Cladotanytarsus conversus* (Joh.); female. a. Genitalia ventral. b. Cercus, lateral. Scale line: 0.1 mm.

Combs of midtibia each with a short spur, outer comb of hindtibia with a long spur, inner comb without a spur. Tarsus 1 of midleg with 3-6 sensilla chaetica towards apex ($n=6$).

Hypopygium (Figs 1, 2). Tergite IX tapered to base of anal point. Anal point long, parallel-sided, bluntly rounded at tip, curved downwards; 0-8 sensilla basiconica in sensillar pit ($n=13$); 4-10 small setae further anteriorad on tergite ($n=12$). Superior volsella small, curved downwards at tip. Digitus long, straight or weakly curved, pointed or blunt at tip. Inferior volsella swollen at tip, bearing 8-15 simple curved setae ($n=11$). Median volsella with simple and 3-7 flattened, branched setae on apical half ($n=12$). Gonostylus narrow.

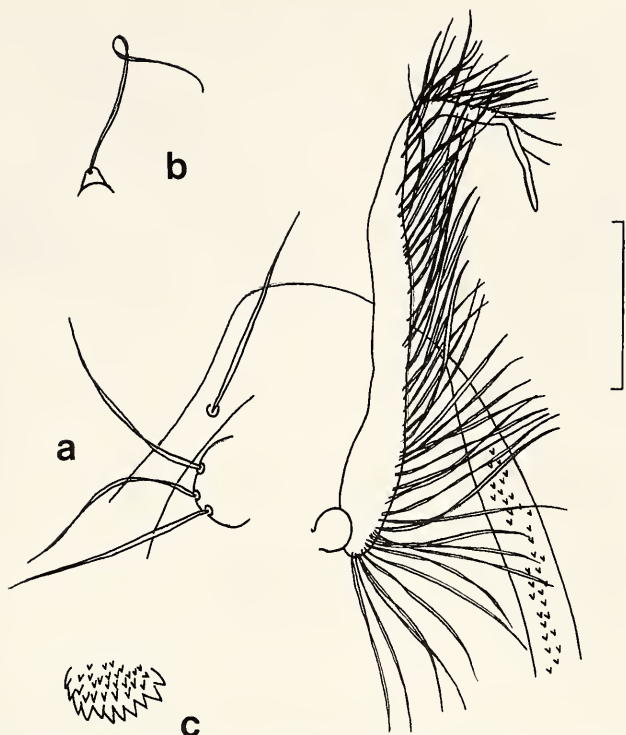


Fig. 4. *Cladotanytarsus conversus* (Joh.); pupa. a. Thorax. b. Cephalic tubercle and frontal seta. c. Comb of segment VIII. Scale line: 1 mm.

Adult female (similar to male except as follows).

Colour. Green; coronal triangle, mouth, median and lateral scutal stripes, a spot on median anepisternum II, and ventral half of preepisternum brown; legs brownish or with only the knees darkened; abdominal tergites from segment III somewhat infuscated.

Head. Setae: 8-16 clypeals, 5-11 temporals (n=7). Antenna: pedicellus 0.80-0.96 as long as broad; flagellomere lengths 1-4 (in μm): 60-80, 38-46, 46-60, 96-140; AR 0.63-0.77 (n=7). Palpomere lengths 1-5 (in μm): 28-32, 32-40, 74-86, 72-80, 122-148 (n=4). Frontal tubercle at most minute, conical.

Thorax. Setae: 8-13 acrostichals, 6-7 dorsocentrals, 1 prealar, 4 scutellars (n=6).

Wing. Length 1.5-1.8 mm (n=4); setae on all veins, macrotrichia over distal third of membrane.

Legs. Segment lengths (in μm) and proportions:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR
p ₁	456-540	320-328	570-640	300-320	220-232	150-160	90-104	1.78-2.0
p ₂	544-584	496-520	250-288	144-152	96-104	64-72	70-72	0.50-0.58
p ₃	568-624	560-640	352-440	240-248	184-200	88-128	72-96	0.58-0.71

Tarsus 1 of midleg with 5-8 sensilla chaetica towards apex (n=3).

Genitalia (Fig. 3). Sternite VIII with caudomesal margins rounded, the median emargination deep, V-shaped or rounded, anteriorly forming a narrow to moderately wide floor to the vagina. Tergite IX rounded, with antero-lateral forked projections and 14-24 setae (n=4). Gonocoxite IX with 1-3 setae (n=4). Cercus 54-70 μm long (n=5). Seminal capsule 48-60 μm long (n=8).

Pupa.

Colour. Transparent; cephalothorax brownish, abdominal armament and apodemes gold.

Exuvial length 2.6-3.6 mm (n=15).

Cephalothorax (Fig. 4a). Cephalic tubercle (Fig. 4b) shallow conical, 20-30 μm high (n=7). Setae:

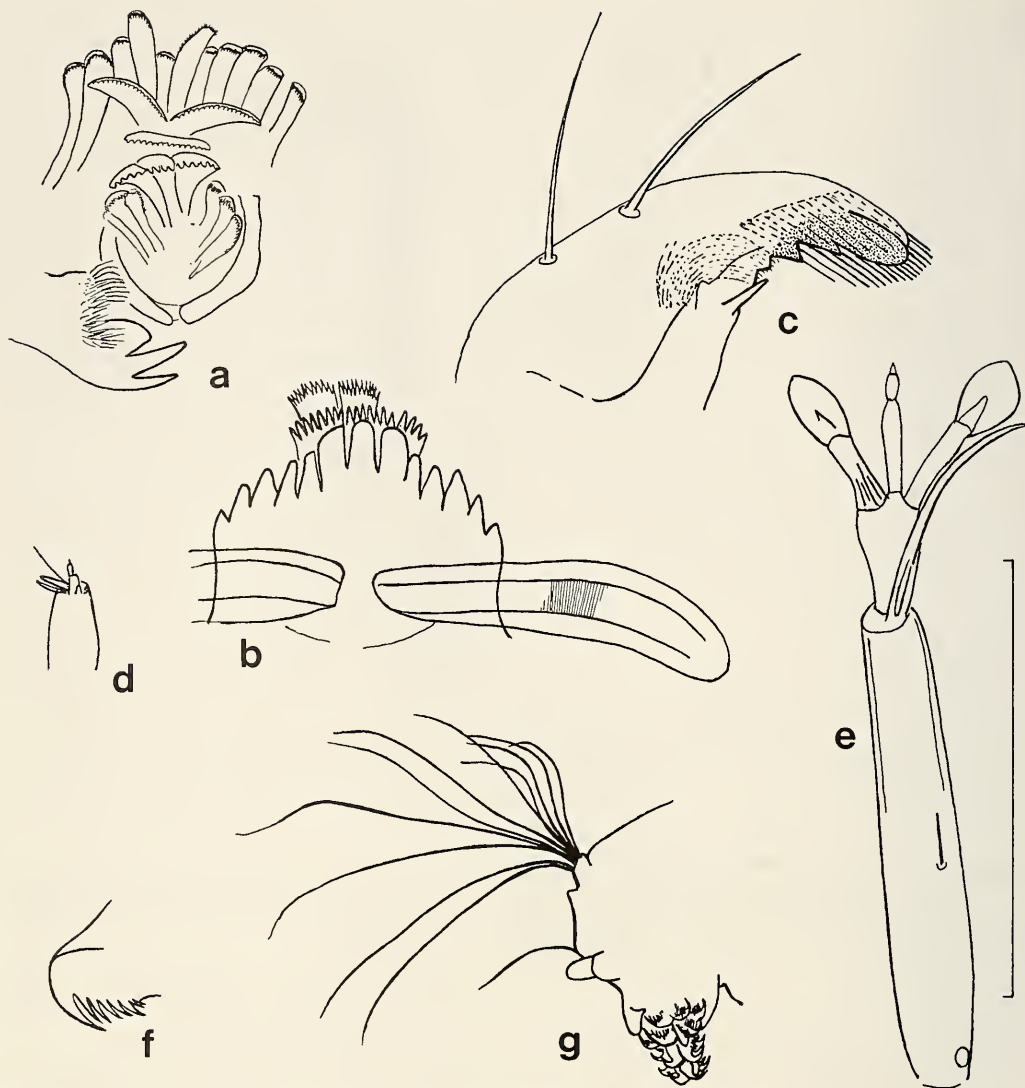


Fig. 5. *Cladotanytarsus conversus* (Joh.); larva. a. Labro-epipharyngeal complex. b. Mentum. c. Mandible. d. Maxillary palp. e. Antenna. f. Basal claw of posterior parapod. g. Anal segment, lateral. Scale line: 0.1 mm for figs a-f, 0.5 mm for fig. g.

frontals (Fig. 4b) taeniate, 130-204 μm long (n=10), precorneals taeniate, 56-220 μm long (n=4), dorso-centrals bristle-like, easily fractured, frequently forked from base, 50-114 μm long (n=6). Thoracic horn (Fig. 4a) 306-464 μm long, fringed along one side with taeniate setae, the latter 140-196 μm long, longest near base, progressively shorter to near horn apex which is bare (n=10). Posterior thoracic mound strongly swollen. Sutural margin with a band of posteriorly directed sharp points medially.

Abdomen. Anterior, longitudinally oval point patches present on tergites II-VI, patches on IV 10-13 points long and $\frac{2}{7}$ points wide, ratios (n=13) of respective patch length to that on IV 0.54-0.8: 0.75-1.06: 1.0: 0.75-1.2: 0.5-1.08. Hook row about half the width of segment II, of 97-135 hooks (n=12). Pedes spurii B weak on segment II. Tergite VIII with anterolateral shagreen patches. Sternites I-III finely shagreened, stronger anterolaterally on II. Posterolateral comb of segment VIII (Fig. 4c) 54-82 μm wide, with 6-9 marginal teeth and scattered ventral points. Chaetotaxy (D = dorsal, V = ventral, L = lateral setae; T = taeniae).



Fig. 6. *Cladotanytarsus conversus* (Joh.); map of known distribution.

	I	II	III	IV	V	VI	VII	VIII	IX
D	2	3	5	5	5	5	5	1	
L	0	3	3	3					
T					3	3	3	4/5	21-30 (n=16)
V	1	3	4	4	4	4	4		
T								1	

Larva (n=12).

Conforms to the generic description given in Pinder & Reiss (1983) except for the structure of the mentum. Briefly described and figured by Zavrel (1934).

Colour. Red in life (after Zavrel). Total body length 3.2-4.3 mm.

Head. Length of head capsule 240-288 μm . Ventral postoccipital margin brown. Antennal pedestal 32-50 μm high. Antenna five-segmented (Fig. 5e); lengths of segments (in μm): 82-108; 16-24; 16-28; 7-12, 4-6; AR 1.28-1.91. Mandible (Fig. 5c) 86-112 μm long. Mentum (Fig. 5b) 62-76 μm wide, with 13 teeth, the 3 median equally well developed, the central one paler than the rest. Labrum (Fig. 5a) and maxillary palp (Fig. 5d) unexceptional.

Body. Posterior parapods with basal claws internally long-serrated (Fig. 5f). Anal segment as in Fig. 5g.

Ecology and phenology. Over the investigated reach of the River Loire (from Nevers to Saumur – 300 km), the species is abundant in the main stream and in the flowing parts of connected water bodies. It also occurs in the potamon of the River Cher, tributary of the Loire. It has been found in a current velocity range of 5 cm/s to over 1 m/s, but most frequently between 30 and 60 cm/s. The water temperature range where it occurs is 14 to 26 °C. The larvae are found mainly in mineral substrata, from sand to boulders, mostly in mixed sand and gravel, though a few have been found amongst roots and on floating plants, submerged plants and wood. The guts of mounted specimens are detritus-filled, without diatom frustules.

The larvae from Lake Ranau, south-west Sumatra, were collected from the sandy littoral at 1-1.5 m depth and from the outflow stream (Thienemann 1954). The lake is large, 18 km long with a maximum depth of 229 m. The water temperature down to 10 m was 27 °C and the oxygen concentration >7 mg/l (Thienemann 1930). Lakes with a good wave action tend to have near saturation oxygen concentrations in the littoral, and lotic chironomids are frequently found there. The guts of the two mounted larvae from Lake Ranau are full of diatom frustules.

In the river Loire emergence of adults occurs from mid May to September.

Discussion

The map (Fig. 6) of the known localities for *C. conversus* suggests a relict late Tethyan distribution. Were this substantiated by further records, an interesting question would arise: over 130 million years what prevents a small species easily dispersed by air movements, inhabiting both stagnant and lotic water over its known range and without a restricted food source, from becoming more diffusely distributed? A possible alternative explanation is that the species originated in the Far East and spread westwards in post-Tethyan times, the high mountain ranges of northern Asia preventing a northward movement.

Tab. 1 shows that the Oriental specimens are mostly smaller and have lower antennal ratios and fewer sensilla basiconica on the anal point than those from the river Loire. The material from Greece and Turkey is morphologically intermediate. It appears that the species forms a cline across its range from the Far East to western France, which may be fragmented through the subsequent loss of linking populations.

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